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Midterm Examination
Coding Theory

27^{th} January 2006

Time: 2 hours (12:30–2:30pm)

1. Our task is to design a Hamming code in the case where there are 4 check digits. First find the binary-representative matrix M to be used for the purpose.[2]† Then construct the code.[5] And then code the message words 10101010101 [4] and 00111100101 [4].

2. Show that the polynomial $x^3 + x^2 + 1$ is irreducible [4] and the element $\alpha = x + \langle x^3 + x^2 + 1 \rangle$ of $F[x]/\langle x^3 + x^2 + 1 \rangle$ primitive [4]. Then use this to construct a binary BCH code of length 7 and minimum distance 3.[5] And then find the code word for the message 1101.[2]

† Numbers placed between square brackets are marks.